Planta

An International Journal of Plant Biology

Vol. 168 1986

Managing Editors:

A. Lang, East Lansing, Mich.
A. Sievers, Bonn
M.B. Wilkins, Glasgow

Editors:

K. Apel, Kiel
C.A. Atkins, Nedlands
J. Barber, London
W.D. Bauer, Columbus, Ohio
F.-W. Bentrup, Giessen
A. Betz, Bonn
J.D. Bewley, Calgary, Alta.
E. Bünning, Tübingen
D.T. Canvin, Kingston, Ont.
M.J. Chrispeels, La Jolla, Cal.
D.T. Clarkson, Bristol
R. Cleland, Seattle, Wash.
J.R. Coggins, Glasgow
G.D. Farquhar, Canberra
M.H.M. Goldsmith, New Haven, Conn.
D. Gradmann, Göttingen
P.B. Green, Stanford, Cal.
H. Grisebach, Freiburg
A.D. Hanson, East Lansing, Mich.
W. Haupt, Erlangen
T.J. Higgins, Canberra
F. Hoffmann, Irvine, Cal.
R. Horgan, Aberystwyth
H.J. Kende, East Lansing, Mich.
H. Kindl, Marburg
H.F. Linskens, Nijmegen
J. MacMillan, Bristol
F. Meins, Jr., Basel
H. Mohr, Freiburg
E.H. Newcomb, Madison, Wis.
D.H. Northcote, Cambridge, UK
C.B. Osmond, Canberra and Reno, Nev.
C. Paech, Brookings, SD
B. Parthier, Halle/Saale
P.H. Quail, Madison, Wis.
G. Richter, Hannover
A.W. Robards, York
E. Schnepf, Heidelberg
J.F. Thompson, Ithaca, NY
M.A. Venis, Maidstone
D.A. Walker, Sheffield
W. Wehrmeyer, Marburg
J. Willenbrink, Köln
H. Ziegler, München

Assistants to the Editors:

W. Hensel, Bonn
S.K. Hillman, Glasgow

Springer-Verlag Berlin Heidelberg New York Tokyo

Planta An International Journal of Plant Biology

Founded in 1925. Volumes 1–34 (1945) edited by *W. Ruhland* and *H. Winkler.* (Volumes 1–21, 1934 published as „Zeitschrift für wissenschaftliche Biologie", Abteilung E.) Volumes 35–47 edited by *W. Ruhland* and *O. Renner.* Volumes 48–51 edited by *W. Ruhland, L. Brauner* and *E. Bünning.* Volumes 52–68 edited by *L. Brauner* and *E. Bünning*

Copyright

Submission of a manuscript implies: that the work described has not been published before (except in the form of an abstract or as part of a published lecture, review, or thesis); that it is not under consideration for publication elsewhere; that its publication has been approved by all coauthors, if any, as well as by the responsible authorities at the institute where the work has been carried out; that, if and when the manuscript is accepted for publication, the authors agree to automatic transfer of the copyright to the publisher; and that the manuscript will not be published elsewhere in any language without the consent of the copyright holders.

All articles published in this journal are protected by copyright, which covers the exclusive rights to reproduce and distribute the article (e.g., as offprints), as well as all translation rights. No material published in this journal may be reproduced photographically or stored on microfilm, in electronic data bases, video disks, etc., without first obtaining written permission from the publisher.

The use of general descriptive names, trade names, trademarks, etc., in this publication, even if not specifically identified, does not imply that these names are not protected by the relevant laws and regulations.

While the advice and information in this journal is believed to be true and accurate at the date of its going to press, neither the authors nor the editors and the publisher can accept any legal responsibility for any errors or omissions that may be made. The publisher makes no warranty, express or implied, with respect to the material contained herein.

Special regulations for photocopies in the USA

Photocopies may be made for personal or in-house use beyond the limitations stipulated under Section 107 or 108 of U.S. Copyright Law, provided a fee is paid. This fee is US $0.20 per page, or a minimum of US $1.00 if an article contains fewer than five pages. All fees should be paid to the Copyright Clearance Center, Inc., 21 Congress Street, Salem, MA 01970, USA, stating the ISSN 0032-0935, the volume, and the first and last page numbers of each article copied. The copyright owner's consent does not include copying for general distribution, promotion, new works, or resale. In these cases, specific written permission must first be obtained from the publisher.

Other regulations

Authors publishing in this journal can, under certain conditions, benefit from library and photocopy fees collected by VG WORT. Authors of German nationality and those resident in the Federal Republic of Germany or Berlin (West), as well as citizens of Austria, Switzerland, and member countries of the European Community, may apply to Verwertungsgesellschaft WORT, Abteilung Wissenschaft, Goethestraße 49, D-8000 München 2, for detailed information.

Springer-Verlag Berlin, Heidelberg, New York, Tokyo – Printers: Universitätsdruckerei H. Stürtz AG, Würzburg – Printed in Germany
© Springer-Verlag Berlin, Heidelberg 1986
Springer-Verlag GmbH & Co. KG, D-1000 Berlin 33

Springer-Verlag
Journal Production Dept. I
Postfach 105 280
D-6900 Heidelberg 1
Telephone (0 62 21) 487-430
Telex 461 723

Springer-Verlag
Heidelberger Platz 3
D-1000 Berlin 33
Telephone (0 30) 82 07-1
Telex 183 319

Springer-Verlag New York Inc.
175 Fifth Avenue
New York, NY 10010, USA
Telephone (2 12) 460-1500
Telex 232 235

Table of Contents Volume 168, 1986

Number 1

H. Quader, G. Deichgräber, E. Schnepf: The cytoskeleton of *Cobaea* seed hairs: Patterning during cell-wall differentiation 1

J.M. Sheldon, H.G. Dickinson: Pollen wall formation in *Lilium*: The effect of chaotropic agents. and the organisation of the microtubular cytoskeleton during pattern development 11

Á. Cséplő, P. Medgyesy: Characteristic symptoms of photosynthesis inhibition by herbicides are expressed in photomixotrophic tissue cultures of *Nicotiana* . . . 24

P.K. Saxena, M. Mii, W.L. Crosby, L.C. Fowke, J. King: Transplantation of isolated nuclei into plant protoplasts. A novel technique for introducing foreign DNA into plant cells 29

S.B. Kikuta, H. Richter: Graphical evaluation and partitioning of turgor responses to drought in leaves of durum wheat 36

J.A. Verbeke, D.B. Walker: Morphogenetic factors controlling differentiation and dedifferentiation of epidermal cells in the gynoecium of *Catharanthus roseus*. II. Diffusible morphogens 43

J.E. Schmidt, J.M. Schmitt, W.M. Kaiser, D.K. Hincha: Salt treatment induces frost hardiness in leaves and isolated thylakoids from spinach 50

V.E.A. Russo: Are carotenoids the blue-light photoreceptor in the photoinduction of protoperithecia in *Neurospora crassa?* 56

K. Manning: Ethylene production and β-cyanoalanine synthase activity in carnation flowers 61

S. Grafflage, G.H. Krause: Simulation of in situ freezing damage of the photosynthetic apparatus by freezing in vitro of thylakoids suspended in complex media 67

G.J. de Klerk, P. Willekens, H. Kok, J.V. Jacobsen: Amylolytic activity in germinated *Agrostemma githago* L. seeds 77

R.C. Leegood, R.T. Furbank: Stimulation of photosynthesis by 2% oxygen at low temperatures is restored by phosphate 84

C.J.S. Smith, A. Slater, D. Grierson: Rapid appearance of an mRNA correlated with ethylene synthesis encoding a protein of molecular weight 35000 94

C. Ettlinger, J. Schindler, L. Lehle: Cell-cycle arrest of plant suspension cultures by tunicamycin 101

G. Ooms, J. Atkinson, M.E. Bossen, R.A. Leigh: T_L-DNA from *Agrobacterium rhizogenes* plasmid pRi1855 reduces the osmotic pressure in transformed plants grown in vitro 106

M. Nsimba-Lubaki, W.J. Peumans, A.K. Allen: Isolation and characterization of glycoprotein lectins from the bark of three species of elder. *Sambucus ebulus*, *S. nigra* and *S. racemosa* 113

V.M. Sponsel: Gibberellins in dark- and red-light-grown shoots of dwarf and tall cultivars of *Pisum sativum*: The quantification, metabolism and biological activity of gibberellins in Progress No. 9 and Alaska 119

A.M. Smith, C.M. Hylton, L. Koch, H.W. Woolhouse: Alcohol dehydrogenase activity in the roots of marsh plants in naturally waterlogged soils 130

N. Sauer: Hexose-transport-deficient mutants of *Chlorella vulgaris*. Lack of transport activity correlates with absence of inducible proteins 139

Number 2

B. vom Dorp, D. Volkmann, G.F.E. Scherer: Identification of tonoplast and plasma membrane in membrane fractions from garden cress (*Lepidium sativum* L.) with and without filipin treatment 151

M.J. Emes, S. England: Purification of plastids from higher-plant roots 161

R. Knoth, P. Hansmann, P. Sitte: Chromoplasts of *Palisota barteri*, and the molecular structure of chromoplast tubules 167

G. Kakefuda, S.H. Duke, M.S. Hostak: Chloroplast and extrachloroplastic starch-degrading enzymes in *Pisum sativum* L. 175

M.J. Carmona, A. Cuadrado: Analysis of growth components in *Allium* roots 183

M. Takahashi, Y. Kamiya, N. Takahashi, J.E. Graebe: Metabolism of gibberellins in a cell-free system from immature seeds of *Phaseolus vulgaris* L. 190

J.I.L. Morison, G.D. Batten: Regulation of mesophyll photosynthesis in intact wheat leaves by cytoplasmic phosphate concentrations 200

T. Sakowicz, G. Gałązka, A. Konarzewska, M. Kwinkowski, J. Kłysik: An unusually high number of direct repeats detected by sequence analysis of the dispersed EcoRI-family fragments in *Lupinus luteus* L. 207

J.E. Brotherton, R.M. Hauptmann, J.M. Widholm: Anthranilate synthase forms in plants and cultured cells of *Nicotiana tabacum* L. 214

M. Steup, C. Schächtele: α-1,4-Glucan phosphorylase forms from leaves of spinach (*Spinacia oleracea* L.). II. Peptide patterns and immunological properties. A comparison with other phosphorylase forms 222

J. Schlee, E. Komor: Ammonium uptake by *Chlorella* 232

A.A. Iglesias, D.H. González, C.S. Andreo: Purification and molecular and kinetic properties of phosphoenolpyruvate carboxylase from *Amaranthus viridis* L. leaves 239

P. Hardy, P. Baldy: Corn phosphoglycolate phosphatase: purification and properties 245

D.H. Greer, J.A. Berry, O. Björkman: Photoinhibition of photosynthesis in intact bean leaves: Role of light and temperature, and requirement for chloroplast-protein synthesis during recovery 253

D.R. Thomas, C. Wood: The two β-oxidation sites in pea cotyledons. Carnitine palmitoyltransferase: Location and function in pea mitochondria 261

R.T. Furbank, F. Rebeille: Dark respiration in the marine macroalga *Chondrus crispus* (Rhodophyceae) . . . 267

G. Weber, E. de Groot, H.-G. Schweiger: Synchronization of protoplasts from *Glycine max* (L.) Merr. and *Brassica napus* (L.) 273

K.A. Santarius: Freezing of isolated thylakoid membranes in complex media. III. Differences in the pattern of inactivation of photosynthetic reactions 281

Short communication

U. Lüttge: Nocturnal water storage in plants having Crassulacean acid metabolism 287

Number 3

K.A. Platt-Aloia, E.M. Lord, D.A. DeMason, W.W. Thomson: Freeze-fracture observations on membranes of dry and hydrated pollen from *Collomia*, *Phoenix* and *Zea* 291

V. Speth, V. Otto, E. Schäfer: Intracellular localisation of phytochrome in oat coleoptiles by electron microscopy 299

B. Steinitz, K.L. Poff: A single positive phototropic response induced with pulsed light in hypocotyls of *Arabidopsis thaliana* seedlings 305
A.C. Kendall, R.M. Wallsgrove, N.P. Hall, J.C. Turner, P.J. Lea: Carbon and nitrogen metabolism in barley (*Hordeum vulgare* L.) mutants lacking ferredoxin-dependent glutamate synthase 316
R.M. Wallsgrove, A.C. Kendall, N.P. Hall, J.C. Turner, P.J. Lea: Carbon and nitrogen metabolism in a barley (*Hordeum vulgare* L.) mutant with impaired chloroplast dicarboxylate transport 324
M.T. Black, P. Lee, P. Horton: Changes in topography and function of thylakoid membranes following membrane protein phosphorylation 330
H. Kubo, H. Mihara: Effects of light and temperature on sporangiophore initiation in *Pilobolus crystallinus* (Wiggers) Tode 337
S. Flores, E.M. Tobin: Benzyladenine modulation of the expression of two genes for nuclear-encoded chloroplast proteins in *Lemna gibba*: Apparent posttranscriptional regulation 340
C.L. Díaz, P.C. van Spronsen, R. Bakhuizen, G.J.J. Logman, E.J.J. Lugtenberg, J.W. Kijne: Correlation between infection by *Rhizobium leguminosarum* and lectin on the surface of *Pisum sativum* L. roots 350
R. Behl, W. Hartung: Movement and compartmentation of abscisic acid in guard cells of *Valerianella locusta*: Effects of osmotic stress, external H^+-concentration and fusicoccin 360
V.K. Rajasekhar, H. Mohr: Appearance of nitrite reductase in cotyledons of the mustard (*Sinapis alba* L.) seedling as affected by nitrate, phytochrome and photooxidative damage of plastids 369
J.J. Sauter, S. Kloth: Plasmodesmatal frequency and radial translocation rates in ray cells of poplar (*Populus* × *canadensis* Moench 'robusta') 377
P. Strasser, G. Falkner: Characterization of the glutamate/aspartate-transport system in a symbiotic *Nostoc* sp. 381
B. Kirschner, H. Hahn: Patatin, a major soluble protein of the potato (*Solanum tuberosum* L.) tuber is synthesized as a larger precursor 386
D. Jeffery, P.W. Goodenough, P.D.J. Weitzman: Enzyme activities in mitochondria isolated from ripening tomato fruit 390
C.W. Imbrie-Milligan, T.K. Hodges: Microcallus formation from maize protoplasts prepared from embryogenic callus 395
F. Feth, R. Wagner, K.G. Wagner: Regulation in tobacco callus of enzyme activities of the nicotine pathway. I. The route ornithine to methylpyrroline 402
R. Wagner, F. Feth, K.G. Wagner: Regulation in tobacco callus of enzyme activities of the nicotine pathway. II. The pyridine-nucleotide cycle 408
T.J. Ingram, J.B. Reid, J. MacMillan: The quantitative relationship between gibberellin A_1 and internode growth in *Pisum sativum* L. 414
B. Demmig, K. Winter: Sodium, potassium, chloride and proline concentrations of chloroplasts isolated from a halophyte, *Mesembryanthemum crystallinum* L. . . . 421

Number 4

M. Kyo, H. Harada: Control of the developmental pathway of tobacco pollen in vitro 427
N.V. Raikhel, R.S. Quatrano: Localization of wheat-germ agglutinin in developing wheat embryos and those cultured in abscisic acid 433
G.I. Cassab: Arabinogalactan proteins during the development of soybean root nodules 441
F. Gubler, J.V. Jacobsen, A.E. Ashford: Involvement of the Golgi apparatus in the secretion of α-amylase from gibberellin-treated barley aleurone cells 447
J. Kesselmeier, U. Laudenbach: Prolamellar-body structure, composition of molecular species and amount of galactolipids in etiolated, greening and reetiolated primary leaves of oat, wheat and rye 453
M. Dauwalder, S.J. Roux, L. Hardison: Distribution of calmodulin in pea seedlings: Immunocytochemical localization in plumules and root apices 461
L. Sossountzov, B. Sotta, R. Maldiney, I. Sabbagh, E. Miginiac: Immunoelectron-microscopy localization of abscisic acid with colloidal gold on Lowicryl-embedded tissues of *Chenopodium polyspermum* L. 471
R. Oelmüller, I. Levitan, R. Bergfeld, V.K. Rajasekhar, H. Mohr: Expression of nuclear genes as affected by treatments acting on the plastids 482
R.K. Monson, B.d. Moore, M.S.B. Ku, G.E. Edwards: Co-function of C_3- and C_4-photosynthetic pathways in C_3, C_4 and C_3–C_4 intermediate *Flaveria* species 493
M.A. Villanueva, T.N. Metcalf III, J.L. Wang: Monoclonal antibodies directed against protoplasts of soybean cells. Generation of hybridomas and characterization of a monoclonal antibody reactive with the cell surface 503
Y. Shimazaki, L.H. Pratt: Immunoprecipitation of phytochrome from green *Avena* by rabbit antisera to phytochrome from etiolated *Avena* 512
M.G. Holmes, J.C. Sager, W.H. Klein: Sensitivity to far-red radiation in stomata of *Phaseolus vulgaris* L.: Rhythmic effects on conductance and photosynthesis 516
P.J. McAuley: Glucose uptake by symbiotic *Chlorella* in the green-hydra symbiosis 523
R.S. Barros, S.J. Neill: Periodicity of response to abscisic acid in lateral buds of willow (*Salix viminalis* L.) . . 530
A. Gardemann, D. Schimkat, H.W. Heldt: Control of CO_2 fixation. Regulation of stromal fructose-1,6-bisphosphatase in spinach by pH and Mg^{2+} concentration 536
K. Raschke, A. Resemann: The midday depression of CO_2 assimilation in leaves of *Arbutus unedo* L.: diurnal changes in photosynthetic capacity related to changes in temperature and humidity 546
H. Lehmann, K. Glund: Abscisic-acid metabolism – vacuolar/extravacuolar distribution of metabolites . . 559
P.J. Ferrar, C.B. Osmond: Nitrogen supply as a factor influencing photoinhibition and photosynthetic acclimation after transfer of shade-grown *Solanum dulcamara* to bright light 563
R. Borchert: Calcium acetate induces calcium uptake and formation of calcium-oxalate crystals in isolated leaflets of *Gleditsia triacanthos* L. 571
L. Faye, J.S. Greenwood, M.J. Chrispeels: Urease in jackbean (*Canavalia ensiformis* (L.) DC) seeds is a cytosolic protein 579
M. Teusch, G. Forkmann, W. Seyffert: Genetic control of UDP-glucose: anthocyanin 5-O-glucosyltransferase from flowers of *Matthiola incana* R.Br. 586
R.J. Whenham, R.S.S. Fraser, L.P. Brown, J.A. Payne: Tobacco-mosaic-virus-induced increase in abscisic-acid concentration in tobacco leaves: Intracellular location in light and dark-green areas, and relationship to symptom development 592

Indexed in *Current Contents*